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F4G GDCB G103 G1602 G1704 G1708 G201 G204 G302 G502

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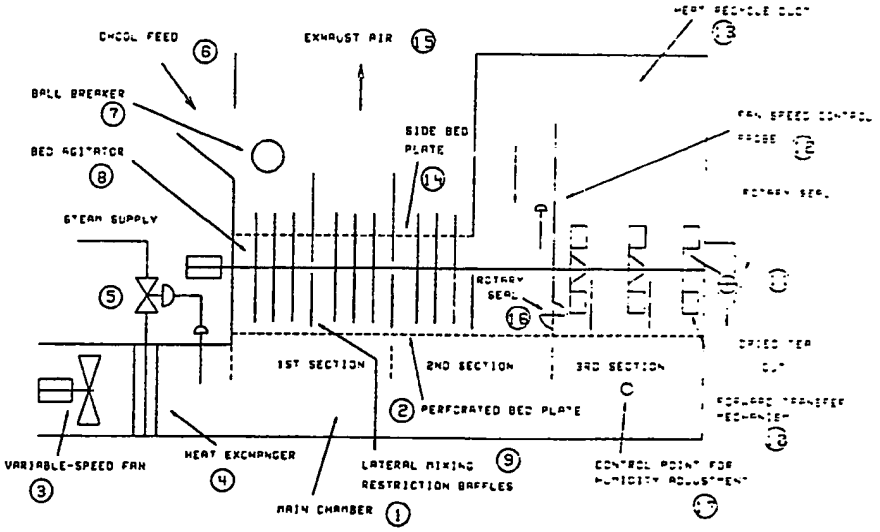
(54) Drying tea

(57) Moist fermented tea enters the dryer at 6 and is fluidised by hot air passing through curved perforated bed plate 2, with agitation by rotor 8. Adjustable baffle plates 1 divide the fluidised bed into sections to minimise lateral mixing. A probe 13 in air exhaust duct 13 controls fan 3 and heat exchanger 4 to adjust hot air volume and temperature and air humidity is controlled at 17 by addition or recycling of moist air, or by addition of water or steam.



BASIC FEATURES: PROPOSED FLUID-BED DRIER

FIG. 1

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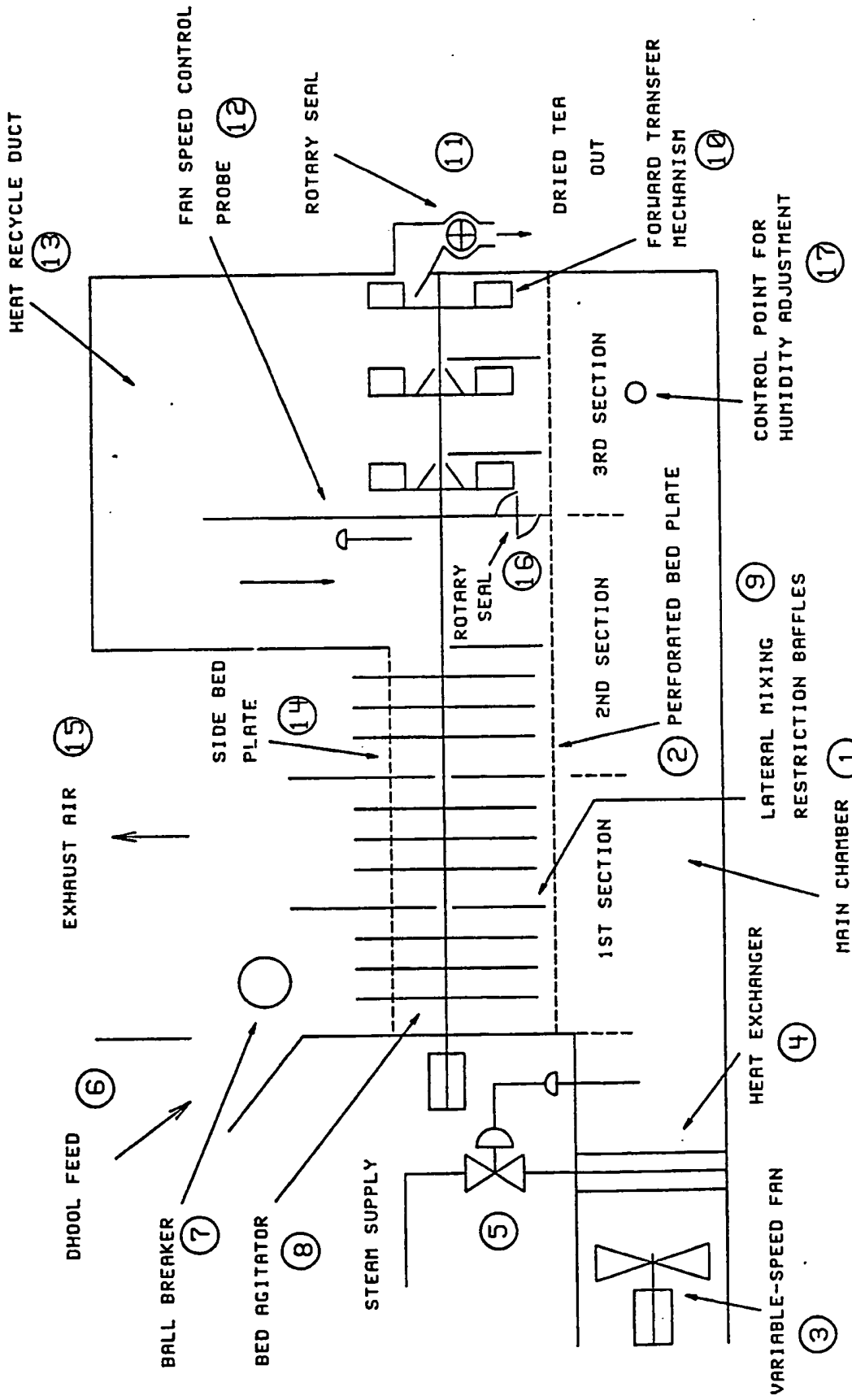

BASIC FEATURES; PROPOSED FLUID-BED DRIER

FIG. 1

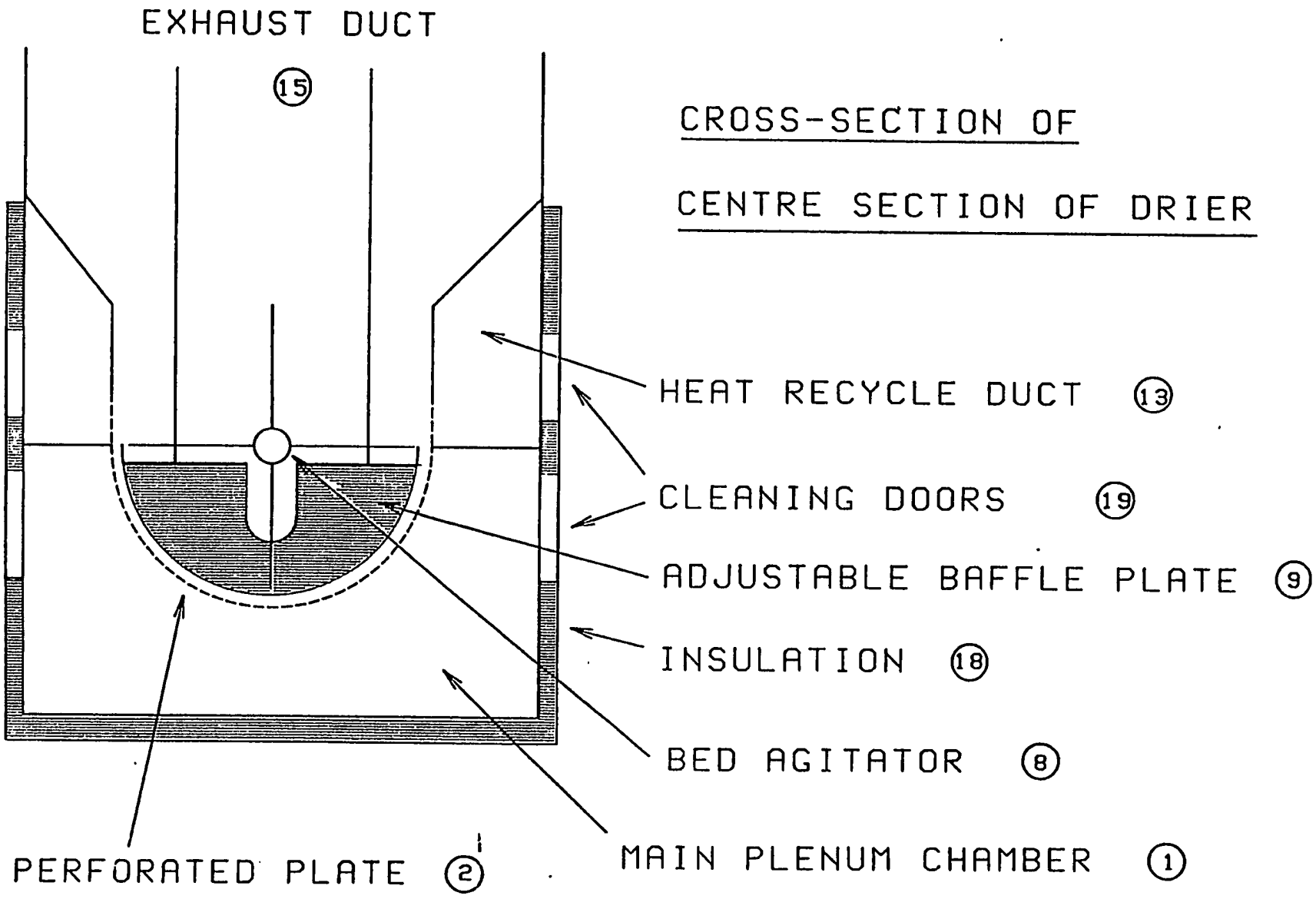

FIG. 2

PATENT APPLICATION

"Method and Apparatus for Drying Tea"

This invention relates to a method and apparatus for drying tea.

During the usual process for the manufacture of black leaf tea, moist fermented leaf, known as dhool, is stabilised and dried by means of a hot air stream. Although there are many different designs of driers, most have certain basic features in common. The older models were generally fitted with a series of moving perforated belts or trays known as bands, arranged in tiers. Hot air was introduced below the lowest band and dhool, having a moisture content of 55-70%, was fed onto the topmost band which moved along the length of the drying chamber and then discharged partially dried material onto the next lower band running back through the drier in the opposite direction. This process was continued until dry black tea with a moisture content of 3-5% emerged from the lowest band.

In order to obtain the desired characteristic and quality of product, it is essential for the tea to be exposed to the correct temperature profile and residence time as the moisture content falls. In practice, this is attempted by adjustment of the inlet air temperature, rate of air flow and rate of passage of tea through the drier. The latter can be controlled by changing the speed of the bands or the thickness of the spread of dhool on the bands.

When fermented leaf is fed to conventional driers, enzymes in the leaf are active during the initial stages of drying while the leaf is warming up, and the development of some of the desirable flavour characteristics of the tea takes place during this period. Once the leaf reaches a moisture level of about 20% these reactions stop, but some enzymes are merely inactivated and not destroyed until later in the process when higher temperatures are reached. At still higher air temperatures the flavour of the tea begins to suffer adversely if the leaf temperature itself gets too high. This picture is contrary to the views held for many years by the industry who believed that the enzymes were inactivated at a much earlier stage soon after the fermented leaf entered the drier.

Attempts to improve the efficiency of tea driers by methods applicable in other fields have generally met with limited success because many of the procedures necessarily cause modifications to the all-important processing conditions.

More recent work and measurements into the gradual post production deterioration of dried black tea has indicated that the distribution of particle residence times within current fluid bed tea driers can bring about post drying deterioration.

While the average residence time may be of the desired order, lateral mixing leads to particles emerging incompletely dried, and in other cases longer residence times can cause overdrying. Both these unwanted situations lead to loss of quality.

Normally there is a relationship between the temperature reached by the tea leaf being dried and the residual moisture in the leaf.

In order to minimise the loss of potential leaf quality it is desirable to attain specific optimum temperatures and moisture levels.

Unfortunately, the tea driers at present employed in the industry do not provide these optima simultaneously. The relationship between the temperature reached and residual moisture in conventional driers may emphasise one quality characteristic to the detriment of another.

The method of drying system now described herein is such that the combination of time, temperature and residual moisture relationships are each controllable without mutual interference so as to optimise the required conditions simultaneously.

A suitable apparatus is described in Fig.1 (side view) and Fig.2 (cross section).

The main hot air plenum chamber with one or more internal sections provides support for a one or more semi circular perforated bed plates 2. Hot air at a controlled volume and temperature is provided by fan 3 and heat exchanger 4. The volume of air may be adjusted by means of dampers or fan speed

controls either manually or preferably automatically by means of a control probe 12 placed in the air exhaust duct some distance before the tea exit point. Temperature control can be achieved by automated controls, the type depending on heating system in use, but in the example of Fig.1 employs a combined steam valve/probe unit 5.

Moist tea to be dried enters at inlet 6, and use may be made of a ball breaker 7 to introduce a spread of particles into the bed below. With many tea processes requiring teas to be fed in at moisture levels above the self-fluidising moisture limit, a rotating shaft 8 with arms or fingers is used to continually agitate the bed during the initial stages of drying. A series of vertical partial baffles 9 placed at intervals along the drier is used to minimise lateral mixing and therefore minimise the widening of the residence time distribution pattern. During the final stages of drying, when the partly dried tea can fluidise without mechanical assistance, a series of shaped paddles 10 is used to provide forward transfer and residence time control between the final group of partial baffles. Dried tea is finally discharged by rotary seal 11. The use of rotary seals 11 and 16 are made necessary in the illustration shown by the employment of heat recovery by partial exhaust recirculation via duct 13 and secondary perforated plate 14, which is an extension of the primary perforated bed 2. The heat recirculation system principle shown is based on British Patent GB 2,002,099.

Final product moisture control is effected by the control of air humidity at 17 by the addition or recycling of a controlled portion of moist air, or by controlled moisture addition directly, in the form of water or steam. This will minimise the lipid oxidation deterioration reactions of tea, found when tea is overdried.

Claims

1. A method for drying tea on a continuous basis whereby the required final moisture content and temperature of the dried tea can be achieved independently by simultaneous and independent control of the temperature and humidity of the incoming air and residence time of the the leaf particles.

2. A method according to claim 1 whereby the relative humidity of the incoming hot air required for drying is controlled during the final stages of drying by the injection of water or water vapour.

3. A method according to claim 1 in which the residence time distribution in a fluid bed drier is narrowed by mechanically transferring the tea between consecutive discrete sections of the drying chamber, which may have flat or contoured bed plates.

4. Apparatus as described and illustrated in Figs. 1 and 2 whereby the tea particles are fluidised by the passage of hot air through a curved perforated bed plate, with mechanical agitation and tea interstage movement by overspilling or mechanical transfer, with humidity and temperature control of the hot air in the final section.

5. Tea made using the methods and equipment described in claims 1-4 above.

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